Technical documentation
Last changed on: 15.10.2019

ESS Series

Single Channel 2 Quadrant High Voltage Module with Floating Ground

- 1 channel, 10 / 20 / 30 kV versions
- 2-quadrant capabilities, usable as unipolar current sink and source
- perfect for electron optical systems and capacitive loads
- low ripple and noise
- floating ground principle
- programmable parameters (delayed trip etc.)

Document history

Version	Date	Major changes
2.2	15.10.2019	improved documentation (Module status, SPS, ADC)
2.1	12.09.2019	improved documentation
2.0	08.01.2018	Relayouted documentation, small fixes

Disclaimer / Copyright

The information in this manual is subject to change without notice. We take no responsibility for any mistake in the document. We reserve the right to make changes in the product design without reservation and without notification to the users. We decline all responsibility for damages and injuries caused by an improper use of the device.

Important security information

It is strongly recommended to read the operator´s manual before operation. To avoid injury of users it is not allowed to open the unit. There are no parts which can be maintained by users inside of the unit. Opening the unit will void the warranty.

We decline all responsibility for damages and injuries caused by an improper use of the module. It is strongly recommended to read the operators manual before operation.

WARNING!

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The non-observance of the advices marked as “Warning!” could lead to possible injury or death.

ATTENTION!

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Advices marked as “Attention!” describe actions to avoid possible damages to property.

INFORMATION

INFORMATION

Advices marked as “Information” give important information.

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1 General description

WARNING!

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High voltage power supplies of the device class generate an output voltage up to 30 kV.
The disregard of this voltage condition can cause death, heavy injuries or material damage.

ATTENTION!

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The devices must only be used in combination with iseg approved crates.

ESS modules are single channel high voltage power supplies in MMS-system (Eurocard format) with 2-quadrant capabilities. It can be used as unipolar current sink and source, which perfectly covers requirements of electron optical systems or capacitive loads.

The ESS series is built in floating ground principle to reduce voltage noise level. The configuration of output voltage and current can be customized on request. The module is made of high precision components such as 24 bit ADC and 16 bit DAC.

2 Technical data

SPECIFICATIONS	ESS
Polarity	Factory fixed, positive or negative
Floating principle	Common Floating Ground
Potential difference	56 V channel to Ground
Ripple and noise (f > 10 Hz)	< 0.6 – 2.5 V (see configurations)
Ripple and noise (f > 1 kHz)	< 0.5 – 2.2 V (see configurations)
Stablity	
Stability – [ΔV_{out} vs. ΔV_{in}]	< 1 • 10^{-4} V_{nom}
Stability – [ΔV_{out} vs. ΔR_{load}]	< 1 • 10^{-4} V_{nom}
Long term stability (1h warmup) 24h	< 1 • 10^{-4} V_{nom}
Temperature coefficient	< 100 ppm / K
Resolution – The resolution of measurable values depends on the settings of the sampling rate and the digital filter!	
Resolution voltage setting	2 • 10^{-5} • V_{nom}
Resolution current setting	2 • 10^{-5} • I_{nom}
Resolution voltage measurement [1]	< 1 • 10^{-5} • V_{nom}
Resolution current measurement [1]	< 1 • 10^{-5} • I_{nom}
Measurement accuracy – The measurement accuracy is guaranteed in the range 1% • V_{nom} < V_{out} < V_{nom} and for 1 year	
Accuracy voltage measurement	± (0.2 % • V_{out} + 0.1 % • V_{nom})
Accuracy current measurement	± (0.2 % • I_{out} + 0.1 % • I_{nom})
Sample rates ADC (SPS)	5, 10, 25, 50, 60, 100, **500** [2]
Digital filter averages	1, 16, **64** [2], 256, 512, 1024
Voltage ramp up / down	up to 0.2 • V_{nom} / s | opt. up to 1 • V_{nom} / s
Digital interface	CAN (potential free)
Protection	Safety loop, overload and short circuit protected (there is only one complete discharge or arc per second allowed!)
HV connector	G31| S10 | S20
System connector	96 PIN (MMS HV compatible, according to DIN 41612)
Safety loop connector	Lemo 2pole
Case	19" plug-in cassette
Dimensions – L/W/H	220 mm / 8HP / 6U
Operating temperature	0 – 50 °C
Storage temperature	-20 – 80 °C
Humidity	20 – 90 %, not condensing

Notes:
[1] The resolution of measurable values depends on the settings of the sampling rate and the digital filter!
[2] Standard factory settings

Table 1: Technical data: Specifications

CONFIGURATIONS EDS SERIES									
Type	**V_{nom}**	**I_{nom}**	**Ch**	**Ripple (V_{p-p})** (customized on request) [f > 10 Hz]	[f > 1 kHz]	**Max. I_{in} (A)** at 24V	**HV connector Standard/**opt.	**Item code**	**Options**
ESS 10 100x	10 kV	4 mA	1	< 2.5	< 2.2	2.5	S10	ES010100x405	
ESS 10 200x	20 kV	2 mA	1	< 0.6	< 0.5	2.5	S20	ES010200x205	
ESS 10 300x	30 kV	1 mA	1	< 1	< 1	2	G31	ES010300x105	

Table 2: Technical data: Configurations

OPTIONS	OPTION CODE	EXAMPLE	ITEM CODE HEX CODING
POLARITY	Positive: **x = p**, Negative: **x = n**	ESS 10 300**p**	

Table 3: Technical data: Options and order information

3 Handling

3.1 Connection

The supply voltages and the CAN interface are connected to the module via a 96-pin connector on the rear side of the module. The physical address of the module, determined by the slot position in the crate, is also accessible via this connector Modules and crate controllers with different settings of bit rate do not work on the same CAN-Line.

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INFORMATION	Note: For proper operation the module must be configured with the correct CAN bitrate, which meets the configuration of the crate controller, the module will be used with. The delivery condition is shown on the modules typeplate (side plate of the module). Typically newer iseg crate controllers (CC24, CC23, CC238) are delivered with 250 kBits/s standard. Wiener M-POD Controller and older iseg hardware is set on 125 kBit/s standard bitrate.

3.2 Module status

The module status is displayed by two LEDs on the front panel

Green LED „OK“ on	all channels have the status “OK“
Green LED „OK“ off	an error occured: safety loop is possibly not closed or the power supplies are out of tolerance or the threshold of V_{max}, I_{max}, I_{set} or I_{trip} (see function descriptions for details) has been exceeded LED will be switched off until the error has been fixed and the corresponding status bit has been erased via software interface.
Yellow LED on	one or more channels have status “HV ON” (voltage on output is greater than 56V)
Green LED blinking	Firmware update is stored into flash, do not switch of power supply, crate etc.

Table 4: Module status information

3.3 Safety Loop

A safety loop can be implemented by the safety loop socket (SL) on the front panel. If the safety loop is active a high voltage generation in any channel is only possible if the safety loop is closed and an internal current in a range of 5 to 20 mA is driven through the loop. If the safety loop is opened during the operation the output voltages will be shut off without ramp and the corresponding bits in the ModuleStatus and ModuleEventStatus are cancelled (see *CAN_EDCP_Programmers-Guide.pdf*). After closing the loop again the ModuleEventStatus has to be reset and the channels have to be switched ON. The loop connectors are potential free, the internal voltage drop is approx. 3 V. By factory setup the safety loop is not active (the corresponding bits are always set). The loop can be activated by removing the jumper “SL-disable” on the rear side of the module.

3.4 Delayed Trip

3.4.1 Operating principle

The function "*Delayed Trip*" provides a user-configurable, time-delayed response to an increased output current (I_{out}) higher than the set current (I_{set}). The response to this kind of event can be, for example, to ramp down the channel with the programmed ramp. A detailed description for the configuration can be found in the manual CAN_EDCP_Programmers-Guide.pdf (see appendix).

By a programmable timeout with one millisecond resolution, the trip can be delayed up to four seconds. If the measured current exceeds the set current the programmed timeout counter is decremented, keeping the output voltage. If the current returns to a value $<I_{set}$ before timeout the counter will be reset. So this process can be restarted if the current rises again.

Note that the actual current is acquired approximately every 150 ms, which can lead to delays in the detection of an exceeded or again reduced current.

If the current at any time exceeds the hardware current limit the channel will be shut off without delay and ramp.

If the *Delayed Trip* function is activated the voltage ramp should be limited to 1 % of V_{nom} before. Higher values could trigger a trip by internal charge balancing during a ramp, even though the output current does not exceed the set value I_{set}.

If the connected load contains capacities or if I_{set} is very small, it might be necessary to further reduce the ramp speed. Alternatively, the *Delayed Trip* can be activated only after the completion of the ramp.

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An activated KillEnable feature disables the Delayed Trip function.

An active *KillEnable* function disables the *Delayed Trip* function. If *KillEnable* is active and a trip occurs, the channel is shut down without ramp at the fastest hardware response time (smaller than 1 ms). However, the actual discharge time strongly depends on the connected load.

4 Front panel versions

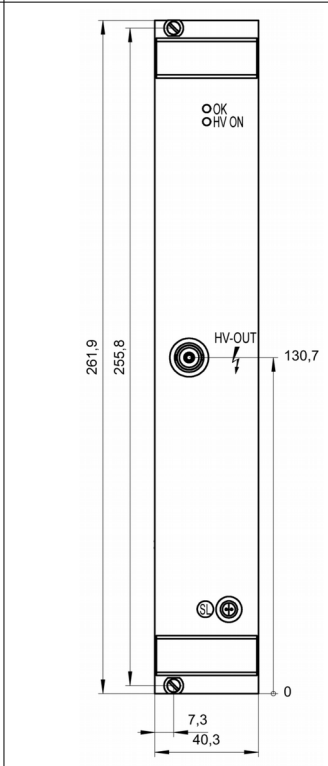
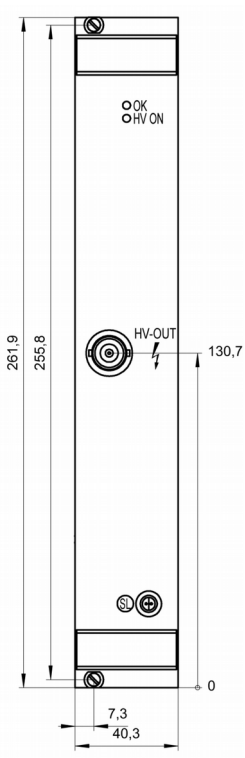
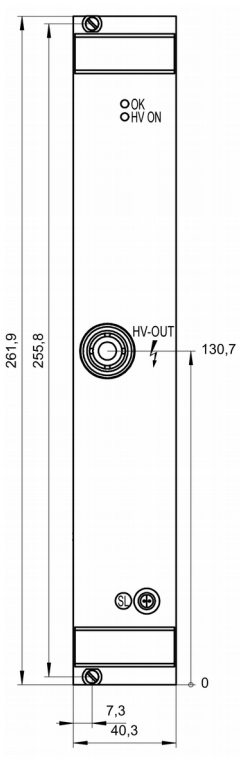
FRONT PANELS			
V_{nom}	10 kV	20 kV	30 kV
Floating	FG	FG	FG
HV Connector	S10	S20	G31
Options			
Figure			

Table 6: Front panel versions

5 Dimensional drawings

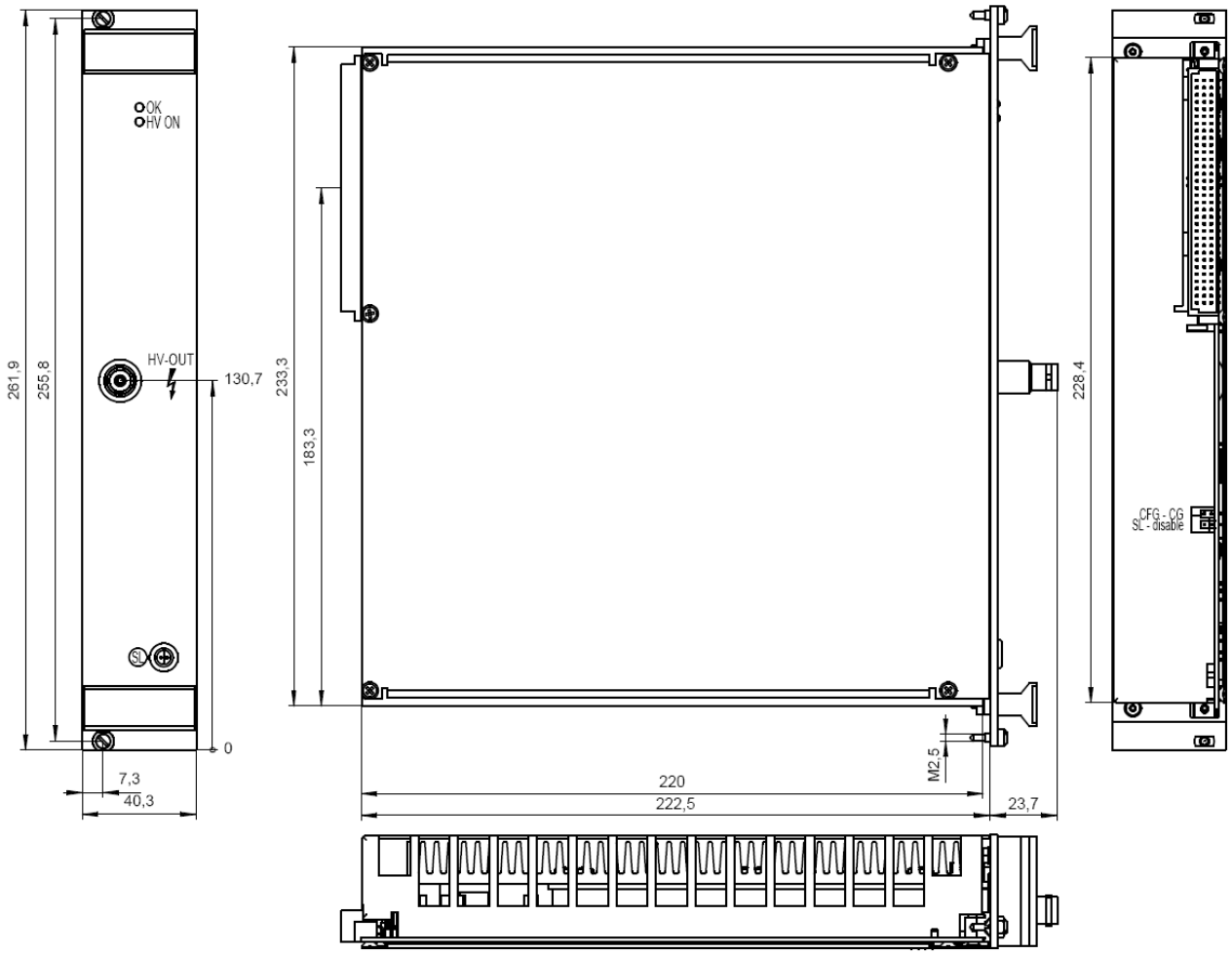


Figure 1: ESS 10 100x

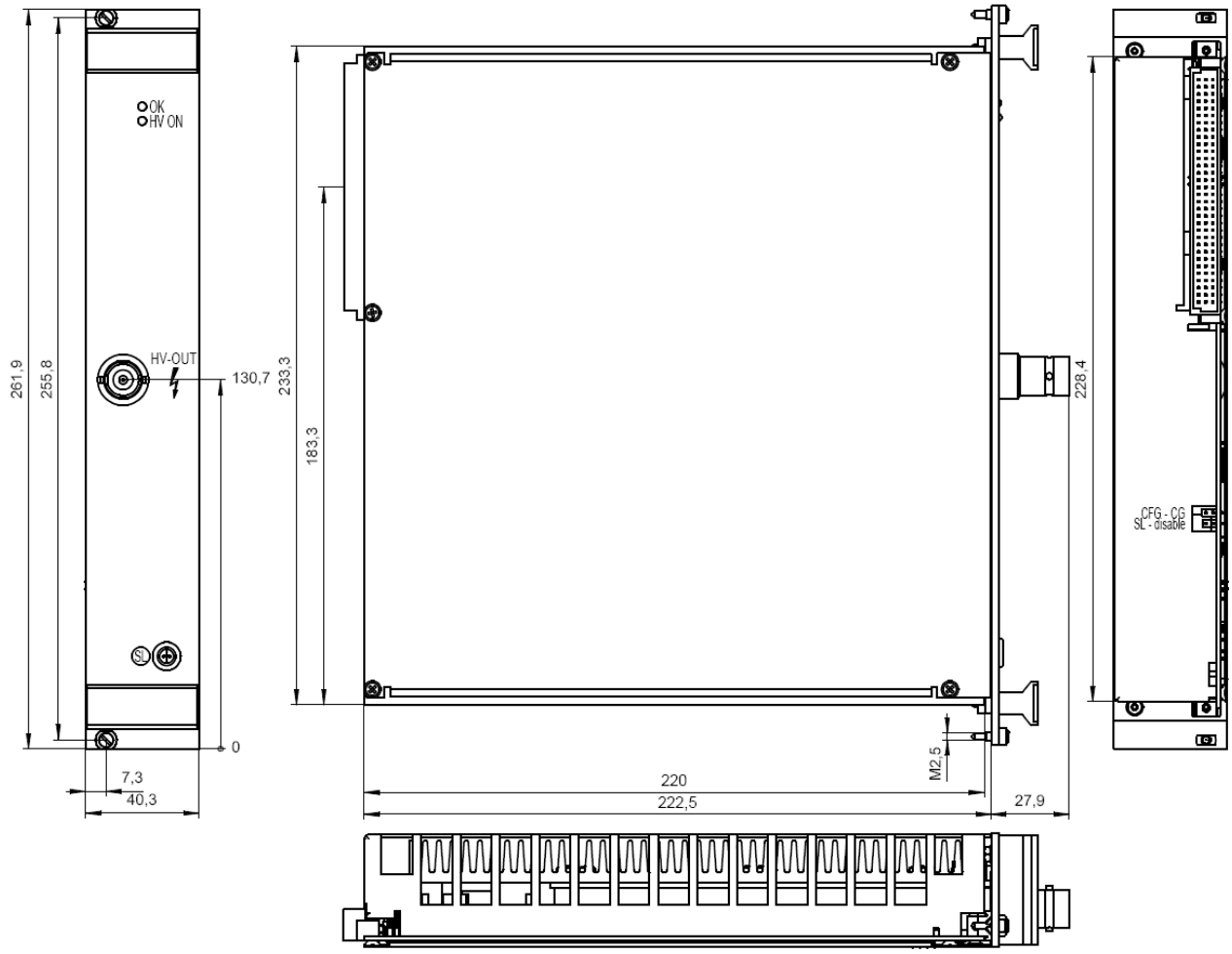


Figure 2: ESS 10 200x

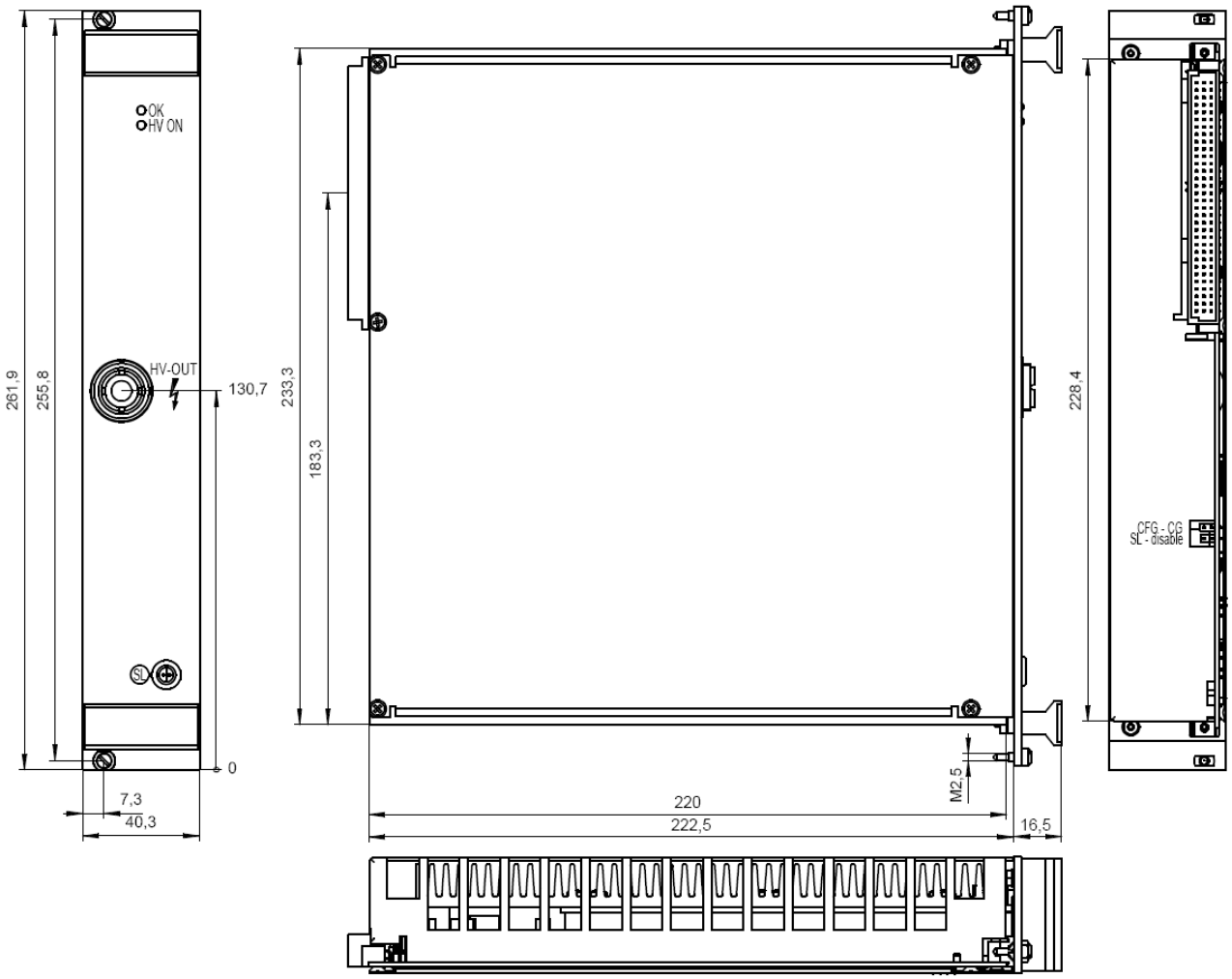


Figure 3: ESS 10 300x

6 Connectors and PIN assignments

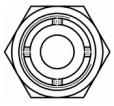
HV CONNECTOR ASSIGNMENTS			
Name	G31	S10	S20
Figure			
SAFETY LOOP			
Name	Safety Loop socket		
Figure			

Table 7: Connector and pin assignments

CONNECTORS PART NUMBERS (manufacturer code / iseg accessory parts item code)			
POWER SUPPLY SIDE		**CABLE SIDE**	
G31 (GES)			
Socket	7331053	Connector	7331052 / Z592501
S10 (KINGS)			
Socket	1064-1 QD	Connector	1065-1 QD / Z592512
S20 (KINGS)			
Socket	1764-1	Connector	1765-1 / Z592668
Safety Loop (LEMO)			
Socket	ERA.0S.302.CLL	Connector	FFA.0S.302.CLAC / Z592312

Table 8: Connectors part number information

7 Accessories

CAUTION!

CAUTION!

Only use genuine iseg parts like power cables, CAN cables and terminators for stable and safe operation.

ACCESSORY ITEM	ORDER ITEM CODE
Lemo plug 2-pole without collet chuck (SL)	Z592312
GES 30kV HV cable plug (HS 31 T)	Z592501
Kings 10kV HV cable plug single pole (1065-1)	Z592512
Kings 20kV HV cable plug single pole (1765-1)	Z592668

8 Order guides

CABLE ORDER GUIDE

POWER SUPPLY SIDE CONNECTOR	CABLE CODE	CABLE DESCRIPTION	LOAD SIDE CONNECTOR	ORDER CODE *LLL = length in m* [1]
G31	02	Lemo HV-cable shielded 30kV (Lemo 130660)	open	G31_C02-*LLL*
S10	04	HV cable shielded 30kV (HTV-30S-22-2)	open	S10_C04-*LLL*
S20	02	Lemo HV-Kabel shielded 30kV (Lemo 130660)	open	S20_C02-*LLL*

[1] *Length building examples: 10cm ➜ 0.1, 2.5m ➜ 2.5, 12m ➜ 012 , 999m ➜ 999*

Table 9: Guideline for cable ordering

CONFIGURATION ORDER GUIDE (item code parts)								
ES	**01**	**0**	**300**	**P**	**105**	**000**	**02**	**00**
High Voltage Series	Numbers of channels	Class	V_{nom}	Polarity	I_{nom} (nA)	Option (hex)	HV-Connector	Customized Version
		0 = standard	three significante digits • 100V For Examle: 030 = 3000V	p = positive n = negative	two significante digits + number of zeros For Examle: 105 = 1mA		04 = S10 05 = S20 08 = G31	00 = none

Table 10: Item code parts for different configurations

9 Appendix

For more information please use the following download links:

This document
http://download.iseg-hv.com/SYSTEMS/MMS/ESS/iseg_datasheet_ESS_en.pdf
CAN EDCP Programmers-Guide
http://download.iseg-hv.com/SYSTEMS/MMS/CAN_EDCP_Programmers-Guide.pdf
iseg Hardware Abstraction Layer
http://download.iseg-hv.com/SYSTEMS/MMS/isegHardwareAbstractionLayer.pdf

10 Warranty & service

This device is made with high care and quality assurance methods. The factory warranty is Standard 36 months. Please contact the iseg sales department if you wish to extend the warranty.

ATTENTION

Repair and maintenance may only be performed by trained and authorized personnel.

For repair please follow the RMA instructions on our website: www.iseg-hv.com/en/support/rma

11 Disposal

INFORMATION

All high-voltage equipment and integrated components are largely made of recyclable materials. Do not dispose the device with regular residual waste. Please use the recycling and disposal facilities for electrical and electronic equipment available in your country.

12 Manufacturer´s contact

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